Tennessee Department of Environment and Conservation
Division of Solid Waste Management

Ground Water Monitoring Guidance For Solid Waste Landfill Units
POLICY

Revision 1, April 2006
(Supersedes the original dated August 28, 2005)

Rule 1200-1-7-.04(7) provides the standards/requirements for the ground water monitoring of solid waste landfill (SWLF) units. This document provides regulatory guidance to the Division of Solid Waste Management (DSWM) staff and owners/operators (O/O) of permitted SWLF units regarding the ground water (GW) monitoring requirements. Additional technical guidance is provided in the 1993 EPA publication (EPA530-R-93-017) titled Solid Waste Disposal Facility Criteria found at web site http://www.epa.gov/epaoswer/non-hw/muncpl/landfill/techman/index.htm. The requirements for the GW detection monitoring system and general sampling, analysis, and recordkeeping requirements are addressed in paragraphs I and II, followed by discussions of the GW detection, assessment, and quality assessment monitoring programs in paragraphs III, IV, and V. Paragraph VI describes when and how off-site drinking water sources are to be included in the assessment efforts. Attachment One consists of a flowchart which summarizes the different steps for GW monitoring and assessment programs as described in paragraphs III through VI below.
Note: Appendices I, II, and III referenced in this document are found in Rule 1200-1-7-.04.

I. GW Monitoring System

The detection GW monitoring system specifications for SWLF units are provided in Rule 1200-1-7-.04(7)(a)3 and are established during the permitting process for new SWLFs. SWLFs that were in existence on the effective date (March 18, 1990) of the new regulatory requirements were required to upgrade their existing system to achieve compliance. SWLFs must have a GW water monitoring system consisting of a sufficient number of wells and/or springs, placed at appropriate locations and depths, to yield GW samples from the uppermost aquifer that:

1. Represent the quality of background GW that has not been affected by leakage from the facility; and

2. Represent the quality of GW passing the compliance boundary hydraulically downgradient (e.g., based on static head differences) from the waste disposal area.

The actual number and placement of wells will be dependent on site-specific factors, including footprint size and physical layout, etc., and must *at least* include 1 upgradient and 2 downgradient monitoring points, unless other monitoring points and locations are otherwise approved by the DSWM.

All monitoring wells must be cased in a manner that maintains the integrity of the monitoring well bore hole and have locking caps. This casing must be fitted with a screened interval, with inert gravel or sand packed around the screen as necessary to enable collection of GW samples at depths where appropriate flow zones exist. The annular space (e.g., the space between the bore hole and the well casing) above the sampling depth must be sealed with a suitable material (e.g., cement grout or bentonite slurry) to prevent contamination of samples and/or the contamination of groundwater, and to prevent the loss of the volatile gases.

Note: Please refer to the 1993 EPA publication (EPA530-R-93-017) titled Solid Waste Disposal Facility Criteria found at web site http://www.epa.gov/epaoswer/non-hw/muncpl/landfill/techman/index.htm for additional standards and technical guidance on the placement and construction of monitoring wells.

II. Sampling, Analysis, and Recordkeeping Requirements

The sampling, analysis, and recordkeeping requirements located in Rule 1200-1-7-.04(7)(a)4 apply to all GW monitoring programs under the regulations as described in this document.

1. GW monitoring programs must include consistent sampling and analytical procedures designed to ensure accurate monitoring results representative of actual GW quality at all monitored points in the approved GW monitoring system.

   (a) At a minimum, the program must include procedures and techniques for:

      (i) Sample collection;

      (ii) Sample preservation and shipment;

      (iii) Analytical procedures;

      (iv) Chain of custody control; and

      (v) Quality assurance and quality control.

   (b) GW monitoring programs must include appropriate sampling and analytical methods, which accurately measure hazardous constituents and other monitoring parameters in GW samples. Unless otherwise approved by the DSWM, appropriate methods from EPA Publication SW-846 shall be used to analyze all samples except drinking water method 508A may be used for polychlorinated biphenyls. The laboratory reporting limits (PQL or PQL equivalent such as EQL, RL, LOQ, etc.) shall be the lowest practical quantitation limits that can be reliably achieved within specified limits of precision and accuracy and shall be at least four times below all established groundwater protection standards in Appendix III of Rule 1200-1-7-.04 or other groundwater protection standards approved by the DSWM. There are SW-846 methods (e.g., 6010B) that have a few analytes (e.g. antimony, cadmium, and thallium) with practical quantitation limits (laboratory reporting limits) that are greater than groundwater protection standard(s). In those few cases, another SW-846 method (e.g., 6020) shall be used with the laboratory reporting limits being the lowest practical quantitation limits that can be reliably achieved within specified limits of precision and accuracy.
   Note: GW samples shall not be field-filtered prior to laboratory analysis, unless both filtered and unfiltered samples are collected and analyzed.

2. GW elevations must be measured (to the nearest 0.01 foot) in each monitoring well prior to purging for every sampling event. The GW elevations shall be measured in all monitoring points whether or not a well will be sampled unless otherwise approved by the DSWM. The elevation for the top of the casing of all monitoring wells and all other monitoring points shall be established to Mean Sea Level (MSL). The O/O must determine the rate and direction of GW flow each time GW is sampled. GW elevations in wells monitoring the same waste management area must be measured in a period of time short enough to avoid temporal variations in GW water flow that could preclude accurate determination of GW flow rate and direction. Normally the measurements are made within a 24-hour period. All monitoring wells shall be inspected for the pad, above ground casing, locking cap, and lock integrity. The O/O shall replace any lock that has been compromised on the day of the finding. The O/O shall repair any monitoring well pad, casing, and locking cap that compromises the integrity of the monitoring well within fifteen days of the finding.

3. The O/O must establish background GW quality in **one or more hydraulically upgradient** well(s) and other approved monitoring points (springs) for each of the monitoring

parameters/constituents of the approved GW program for the affected SWLF unit as required by Rule 1200-1-7-.04(7)(a)3(i). Rule 1200-1-7-.04(7)(a)5(ii)(II) requires a minimum of four independent samples be collected from each monitoring well (point) and analyzed for the constituents contained in Appendix I of this Rule, or those in the alternative list approved under Rule 1200-1-7-.04(7)(a)5(i)(I) or (II), prior to or during the first semi-annual sampling event period. Ideally, these four independent samples (from each monitoring point) should be collected and analyzed at three-month intervals (to enable fluctuations due to seasonal variations to be taken into account) prior to the initial semi-annual sampling event; however, at a minimum, each of the four independent samples (from each monitoring point) must be collected and analyzed at approximately two month intervals throughout the six month long semi-annual sampling event, after the initial background sampling event. Unless the O/O can demonstrate that the up-gradient GW quality has been impacted by another source, the background levels for constituents that do not naturally occur, shall be the laboratory reporting limits (PQL or PQL equivalent such as EQL, RL, LOQ, etc.) for use in all GW Monitoring data evaluations. (Please read the note in subparagraph II.4 immediately below for additional clarification.)

4. The O/O must select and report in the GW Detection Monitoring Program document (Paragraph III below) a statistical method to be used in evaluating GW monitoring data. The number of samples collected to establish GW quality data must be consistent with the appropriate statistical procedures determined pursuant to Rule 1200-1-7-.04(7)(a)4(v). If the O/O desires to utilize an alternative statistical method, he must request a variance under Rule 1200-1-7-.04(7)4(vi) and receive approval from the DSWM prior to utilizing the alternative statistical method. Statistical evaluations are not applicable to all constituents that do not naturally occur unless the O/O can demonstrate to the Division's satisfaction that the contamination is from another source.
Note: If background has not been established from an upgradient-monitoring point, then the O/O must install and sample at least one upgradient monitoring well to establish background. At existing facilities where background has not been established and the O/O can demonstrate to the Division's satisfaction that it is not possible to install an upgradient monitoring well(s) and no other options (e.g., spring) are available, then the O/O shall provide an alternative approach for statistical comparisons for DSWM approval. All demonstrations referred to in this note shall be submitted in a report certified in accordance with subparagraph II.8 below. Additionally if waste was placed in the SWLF unit prior to establishment of background concentrations under subparagraph II.3 above, resulting in the possibility that the downgradient wells have been affected, then the O/O ***cannot*** *use any method that relies on intra-well comparisons unless the O/O can demonstrate to the Division's satisfaction that the monitoring point was not impacted at the time of sampling.*

5. The O/O must keep records of all GW activities conducted, all analytical results obtained, and all associated GW surface elevation measurements throughout the active life of the facility and throughout the post-closure care period as well. Such records must be kept at the facility or at some other location within Tennessee as specified in the permit.

6. The O/O must determine whether or not there has been a statistically significant increase above background values for each parameter or constituent, as required in the approved monitoring program for the SWLF, as dictated in the regulations and permit, and as described in this document. Comparison must be made of subsequent sample analytical results to background concentrations or values established using the selected statistical procedure, which will at least meet the general performance standard of assuring with a reasonable degree of confidence that the migration of waste constituents from the facility into or through the uppermost aquifer at the compliance monitoring boundary will be detected. Statistical evaluations are not applicable to all constituents that do not naturally occur unless the O/O can demonstrate to the Division's satisfaction that the contamination is from another source. If any constituent that does not naturally occur is detected and the O/O **cannot** demonstrate to the Division's satisfaction that the contamination is from another source, then the landfill has impacted the GW and the presence of the constituent(s) are considered verification that there is a statistically significant increase above background value(s).
Note: If waste was placed in the SWLF unit prior to establishment of background concentrations resulting in the possibility that the downgradient wells have been affected, then the O/O ***cannot*** *use any method that relies on intra-well comparisons unless the O/O can demonstrate to the Division's satisfaction that the monitoring point was not impacted at the time of sampling. At*

existing facilities where background has not been established and the O/O can provide documentation and justification that it is not possible to install an upgradient monitoring well(s), then the O/O shall provide an alternative approach for statistical comparisons for DSWM approval.

7. All GW sampling and analysis results, statistical determinations, and associated recordings of GW water surface elevations must be submitted to the DSWM within sixty (60) days following the last day of the sampling event. To facilitate handling and evaluation of this data, the Commissioner may specify the manner and form in which the data must be reported as authorized in Rule 1200-1-7-.04(7)(a)4(viii). All GW monitoring reports shall at a minimum provide the following:

   (a) A description of the sampling procedures performed (including field measurements of pH, conductivity, temperature, turbidity, etc.; and calculations/measurements of purge volumes), the date(s) and time(s) of field activities (including field instrument calibration and decontamination), and the weather conditions at the site when the activities were performed. Much of this information may be reported in field data forms for each monitoring point. The sampling shall be conducted in accordance with procedures established in an approved Detection Monitoring or GW Quality Assessment Program.

   (b) The MSL elevation of the top of the casing for each monitoring well, the location and the GW surface elevations for each monitoring point (e.g., wells, springs, etc.), and the GW flow direction and rate.

   (c) A description of the results the inspections of all monitoring wells pad, above ground casing, locking cap, and lock The O/O shall replace any lock that has been compromised on the day of the finding. The O/O shall repair any monitoring well pad, above ground casing, and locking cap that compromises the integrity of the monitoring well within fifteen days of the finding.

   (d) On a to-scale map of the facility, the locations of all monitoring points, the MSL potentiometric surface determined from water level measurements collected during the event, the property boundaries, and active and closed fill areas.

   (e) A list of the monitoring parameters and the methods used to analyze the samples.

   (f) Copies of the chain of custody forms and the laboratory report sheets.

   (g) Tables listing each monitoring point and including the results of the most recent sampling event, background GW quality concentrations established under subparagraph II.3 above, and GW protection standards established under part IV.1.(c) below for all parameters/constituents. (These tables shall also be provided in a spreadsheet(s) on computer disk.)

   (h) The statistical method used that is established in accordance with subparagraph II.4 above.

   (i) The results of the statistical evaluation to determine whether or not there has been a statistically significant increase above background values for all naturally occurring parameters/constituents monitored.
   Note: Other constituents, that do not naturally occur and O/O have demonstrated to the Division's satisfaction that the contamination is from another source, shall also undergo statistical evaluation.

   (j) For SWLFs that are submitting a report under the GW Quality Assessment Program under paragraph V. below must include a narrative description of the rate and extent of migration of waste or waste constituents in the GW. In addition to the information required in part II.6.(i) above, the to-scale map(s) must show the extent of contamination for all parameters/constituents that are above the groundwater protection standards.

(k) A conclusion section that summarizes the results of the GW sampling event, notes anything unusual, and provides the appropriate sampling/analyses determinations (based on the appropriate GW monitoring program) and the approximate start date for the next planned sampling event. The conclusion shall also summarize all naturally occurring constituents that are statistically significant above background values, all detected constituents that do not naturally occur, and all constituents that exceed the GW protection standards established under part IV.1.(c) below.

(l) The certification described in subparagraph II.8 below.

8. All plans, programs, and reports must be certified by a person representing the O/O as described in Rule 1200-1-7-.02(2)(a)7, 8 and 10.

III. Detection Monitoring Program

Detection Monitoring Program requirements are found in Rule 1200-1-7-.04(7)(a)5 and are established during the permitting process for SWLFs.

1. The program must be described in a document titled "Ground Water Detection Monitoring Program Plan" and is part of the permit (Narrative Description of the Facility and Operations). The GW Detection Monitoring Program Plan must be submitted to the DSWM for approval. Normally this occurs during the permitting process. The O/O cannot make modifications to the approved GW Detection Monitoring Program Plan without submitting a written request and receiving written approval from the DSWM. The GW Detection Monitoring Program Plan must describe the following:

   (a) For each monitoring point, the detection monitoring parameters for which the GW sample will be analyzed and the analytical method to be utilized.
   Note: The parameters will be those set forth in Appendix I unless DSWM has approved in writing a request to delete any of the Appendix I parameters and/or establish an alternative list of inorganic indicator parameters in accordance with Rule 1200-1-7-04(7)(a)5(i) (I) and (II).

   (b) Each of the monitoring points (e.g., wells and springs) in the approved GW monitoring system, and the frequency at which each point will be sampled. The monitoring points must be shown on a to-scale map of the facility which also shows the boundaries of the facility and the active, closed, and planned fill areas; roads and buildings; and topographic features (e.g., sinkholes). Unless otherwise specifically approved by the DSWM, each monitoring point must be sampled at least semi-annually.

   (c) The background GW quality data established or to be established for newly permitted SWLF in accordance with subparagraph II.3 above.

   (d) The field procedures to be utilized in measuring water levels, purging monitoring wells, and collecting GW water samples from monitoring wells, springs (where applicable), and/or domestic water supply wells (where applicable). This must identify how portable, direct reading electronic instruments will be utilized in the field efforts, and how the field efforts and resulting data will be recorded.

   (e) The method to be used for each sampling event to perform the statistical evaluation of the analytical data required in subparagraph II.4 above. Such evaluations must be performed for **each** sampling event in accordance with a method listed in Rule 1200-1-7-.04(7)4(v) unless an alternative statistical method is specifically approved by the DSWM. If the O/O desires to utilize an alternative statistical method, he must request a variance under Rule 1200-1-7-.04(7)4(vi) and receive approval from the DSWM under Rule 1200-1-7-.01(5) prior to utilizing the alternative statistical method.
   Note: O/O shall follow the guidance in subparagraphs II.3, II.4 and II.6 above regarding background and statistical methods.

(f) All GW Detection Monitoring reports shall be submitted in compliance with the requirements of subparagraph II.7 above.

2. If the O/O determines that there is a statistically significant increase above background for any constituent that naturally occurs or the detection of any constituent that does not naturally occur for one or more approved detection monitoring parameters, then the O/O must, within 14 days of this finding, send a notice to the DSWM adequately detailing the findings. Statistical evaluations are not applicable to all constituents that do not naturally occur unless the O/O can demonstrate to the Division's satisfaction that the contamination is from another source. If any constituent that does not naturally occur is detected and the O/O **cannot** demonstrate to the Division's satisfaction that the contamination is from another source, then the landfill has impacted the GW and the existence of the constituent(s) documents for all purposes that there is a statistical significant increase above background value(s). The O/O has 90 days [Rule 1200-1-7-.04(7)(a)5(iii)(III)] from sample analysis to demonstrate that a source other than a SWLF unit caused the contamination or that the statistically significant increase resulted from error in sampling, analysis, and/or statistical evaluation, or from natural variation in GW quality. The 90-day time frame for a demonstration begins on the date the sample(s) is analyzed by the laboratory. A report documenting this demonstration must be certified by a qualified GW scientist and approved by the DSWM. If a successful demonstration is documented and approved, the O/O may continue detection monitoring as specified in this section. If, however, such a demonstration is not documented by the O/O and approved by the DSWM within 90 days from the date the sample(s) is analyzed by the laboratory, then the O/O shall initiate an assessment monitoring program as set forth in paragraph IV below [Rule 1200-1-7-.04(7)(a)5(iii)(III)].

IV. Assessment Monitoring Program

Assessment monitoring is required whenever a statistically significant increase above background has been determined for any constituent that naturally occurs or the detection of any constituent that does not naturally occur for one or more of the Appendix I constituents or alternative constituents approved under Rule 1200-1-7-.04(7)(a)5(i)(I) or (II). Statistical evaluations are not applicable to all constituents that do not naturally occur unless the O/O can demonstrate to the Division's satisfaction that the contamination is from another source. There are three distinct phases to the GW assessment program, which the DSWM refers to as Phase 1, 2 and 3. The three different phases of GW Assessment are described in subparagraphs IV.1, IV.2, and IV.3 below.

Note: The O/O may document or attempt to document that the impact to the GW is due to gas migration and not from leachate at the SWLF. Regardless of how the GW is impacted by a SWLF (gas or leachate), if the constituents are above background, the SWLF remains in assessment. SWLF impacts by gas migration do not in any way eliminate or reduce the duty to comply with the assessment and corrective action requirements. However, the O/O may take immediate action to correct the likely cause of the impact (gas and/or leachate), but the O/O cannot defer compliance with the required assessment activities.

1. GW Assessment Monitoring Phase 1

(a) Ninety (90) days from sample analysis showing a statistically significant increase above background for any constituent that naturally occurs, or the detection of any constituent that does **not** naturally occur for one or more of Appendix I constituent(s) or alternative constituent(s) [Rule 1200-1-7-.04(7)(a)6(ii)], the O/O shall initiate GW Assessment Monitoring Phase 1. Within the next 90 day of initiating GW Assessment Monitoring Phase 1, the O/O shall:

(i) Initial Assessment Sampling Event - Sample and analyze all downgradient-monitoring points (e.g., wells, springs, etc.) for all Appendix II constituents for the initial assessment sampling event. The O/O may request deletion of some of the Appendix II constituents from this initial assessment sampling event, provided he can adequately justify that the removed constituents are not reasonably expected to be in, or derived from, the waste contained in the unit. The O/O may also request approval to sample an appropriate subset of monitoring points. All requests shall be made in writing with justification and be certified by a person representing the O/O in accordance with subparagraph II.8.

Note: In order to comply with the ninety (90) day time frame, this must be conducted within the first thirty (30) days.

(ii) Background Sampling for Identified Appendix II Constituents - Sample and analyze all approved upgradient and downgradient monitoring points (e.g., wells, springs, etc.) for four independent samplings within sixty (60) days in order to comply with the ninety (90) day time frame. The samples shall analyzed for all Appendix II constituents detected in the Initial Assessment Sampling Event described in subpart IV.1.(a)(i) that had not been previously detected. The purpose of the four sampling events is to establish background for any Appendix II constituent for which background had not been previously established and obtain data for the required statistical evaluation. Background must be established from an upgradient monitoring point for any Appendix II constituent that background had not been previously established. Unless the O/O can demonstrate that the up-gradient GW quality has been impacted by another source, the background levels for constituents that do not naturally occur shall be the laboratory reporting limits (PQL or PQL equivalent such as EQL, RL, LOQ, etc.) for use in all GW monitoring data evaluations.
Note: Please read the note in subparagraph II.4 above for additional clarification

(b) The O/O must notify the DSWM of all detected Appendix II constituents within 14 days of obtaining analytical results [Rule 1200-1-7-.04(7)(a)6(iii)(I)] in compliance with part IV.1.(a) above.

(c) Within sixty (60) days after completing the sampling under part IV.1.(a) above, the O/O must submit a report that complies with all of the parts in subparagraph II.7 above. If all Appendix II constituents concentrations are **below** the GW protection standards, then the O/O shall proceed to Phase 2 of the Assessment Monitoring Program (subparagraph IV.2 immediately below). If any Appendix II constituent concentration is **above** its GW protection standard, then the O/O must notify the DSWM within 14 days of the this finding and proceed to a GW Quality Assessment Program (paragraph V. below).

(d) All SWLFs must be designed, constructed, operated, maintained, closed, and cared for after closure to comply with the GW protection standards.

(i) The GW Protection Standards shall be:

(1) For constituents for which a maximum contaminant level (MCL) is listed in Appendix III of Rule 1200-1-7-.04, the MCL for that constituent; or

(2) For constituents for which MCLs have not been promulgated, the background concentration for the constituent established from wells installed in accordance with Rule 1200-1-7-.04(7)(a)3; or

(3) For constituents for which the background level is higher than the MCL in Appendix III of Rule 1200-1-7-.04 or health based levels identified under subpart IV.1.(d)(ii) below, the background concentration.

(ii) The O/O may request, and the DSWM may approve, an alternative GW protection standard for constituents without MCLs. The MCLs are provided in Appendix III of Rule 1200-1-7-.04. Each alternative GW protection standard shall be one number for the site, like a MCL, that does not vary from monitoring point to monitoring point. The alternative GW protection standard cannot be changed from monitoring event to monitoring event because the data used for establishing a standard is based on long-term exposure. The request must be in the form of an Alternate GW Protection Demonstration Report prepared and certified by a qualified toxicologist. The report must demonstrate that the requested alternative GW protection standard(s) is protective of public health

and the environment in compliance with all the requirements under Rule 1200-1-7-.04(7)(a)1(ii) and (iii) [this subpart and subpart (iii) below]. [See the note at the end of part IV.1.(d).] The report must also be certified by the O/O. These GW protection standards shall be appropriate health based levels that satisfy the following criteria:

(1) The level is derived in a manner consistent with Environmental Protection Agency guidelines for assessing the health risks of environmental pollutants (51 CFR 33992, 34006, 34014, 34028, Sept. 24, 1986);

(2) The level is based on scientifically valid studies conducted in accordance with the Toxic Substances Control Act Good Laboratory Practice Standards (40 CFR part 792, August 17, 1989) or equivalent;

(3) For carcinogens, the level represents a concentration associated with an excess lifetime cancer risk level (due to continuous lifetime exposure) within the 1.0×10^{-4} to 1.0×10^{-6} range; and

(4) For systemic toxicants, the level represents a concentration to which the human population (including sensitive subgroups) could be exposed to on a daily basis that is likely to be without appreciable risk of deleterious effects during a lifetime. For purposes of this subpart, systemic toxicants include toxic chemicals that cause affects other than cancer or mutation.

(iii) The synergistic/additive impacts due to the presence of multiple contaminants in the GW, exposure threats to sensitive environmental receptors, and other site-specific exposure or potential exposure to GW should be taken into consideration in establishing alternative GW protection standards.

Note: In lieu of having a qualified toxicologist prepare and certify an Alternate GW Protection Demonstration Report, the O/O and his/her representative may use USEPA Region 9's Preliminary Remediation Goals for tap water as alternative GW protection standards for constituents without MCLs. USEPA Region 9's Preliminary Remediation Goals and User's Guide and Background Technical Document can be found at http://www.epa.gov/region09/waste/sfund/prg/index.html. Each alternative GW protection standard shall be one number for the entire site, like a MCL GW protection standard, that does not vary from monitoring point to monitoring point.

2. GW Assessment Program-Phase 2

(a) Sampling and Analysis

(i) The O/O must semi-annually sample and analyze GW samples from all monitoring points (e.g., wells, springs, etc.) for the following:

1st Sampling Event:	All Appendix I constituents, any additional approved alternative parameters, and all other Appendix II constituents that have been previously detected during GW monitoring.
2nd Sampling Event:	All Appendix II constituents and any additional approved alternative parameters.

(ii) The O/O may request to delete any of the Appendix II monitoring parameters for a SWLF unit if it can be shown that the removed constituents are not reasonably expected to be in or derived from the waste contained in the unit.

Additionally, the O/O may request to sample a selected subset of monitoring points for the Appendix II monitoring parameters. All requests shall be made in writing prior to the sampling event with adequate justification and be certified by a person representing the O/O in accordance with subparagraph II.8 above. A reduction in sampling parameters and/or monitoring points requires approval by the DSWM prior to the sampling event.

(b) Within sixty (60) days after completing the semi-annual sampling under part IV.2.(a) above, the O/O must submit a report in compliance with subparagraph II.7 above. [Rule 1200-1-7-.04(7)(a)6(ii)]. If all Appendix II constituents concentrations are **below** the GW protection standards, then the O/O shall remain in the GW Assessment Program under Phase 2 until all naturally occurring Appendix II constituents are statistically below background and other constituents that do not naturally occur (e.g. organics) are below their laboratory reporting limit for two consecutive sampling events. If any Appendix II constituent concentration is **above** its GW protection standard, then the O/O must notify the DSWM within 14 days of the this finding and proceed to a GW Quality Assessment Program (paragraph V. below).

V. GW Quality Assessment Program - Phase 3

1. The O/O must submit a **GW Quality Assessment Plan** to the DSWM not more than forty-five (45) days after the O/O is aware that any Appendix II constituent(s) concentration(s) is **above** its GW protection standard. Additionally, Rule 1200-1-7-.04(7)(a)7 requires the O/O to initiate the assessment of corrective measures within ninety (90) days after the O/O is aware of any exceedance. The DSWM should send a **Notice of Violation "NOV"** letter to the O/O for violating the GW Protection Standard under Rule 1200-1-7-.04(7)(a). The **"NOV"** should establish the compliance date for the submittal of the **GW Quality Assessment Plan. The DSWM is authorized to require the O/O take any measure necessary to protect human health and the environment [Rule 1200-1-7-.04(7)(a)9(i)(III)] and the DSWM may require such action at any time [Rule 1200-1-7-.04(7)(a)6(iv)(VIII)].**

2. GW Quality Assessment Plans shall describe in detail the activities necessary to:

   (a) Determine whether solid waste or solid waste constituents from the SWLF have entered the GW, the rate and extent of migration of waste or waste constituents in the GW, and the concentration in the GW of such waste or waste constituent(s).

   (b) Specify the number of additional GW sampling locations (springs and wells) and depth of additional well(s) to define the nature and the vertical and horizontal extent of the release. At least one additional monitoring well must be installed at the SWLF boundary in the direction of the contaminant(s) migration.

   (c) Notify all persons who own land or reside on the land that directly overlies any part of the plume of contamination if contaminants have migrated off-site.
   Note: This shall be documented and updated annually as required under subpart VI.2.(a)(iii).

   (d) Identify all domestic and commercial water use sources within a one-mile radius from the center of the SWLF. The plan must propose a user survey that identifies all sources of drinking water (wells and/or springs) within a one-mile radius from the center of the SWLF. The plan must specify that a report containing the results of the survey will be submitted to the DSWM within 45 days of approval of the plan. The O/O may request a reduction or modification to the one-mile radius if adequate justification (e.g. a hydrogeologic barrier or divide such as river is within the one-mile radius) is provided and accepted by the DSWM. The survey report shall contain a topographic map (or legible enlarged copy) identifying the drinking water sources, the latitude and longitude coordinates, the names, addresses and phone numbers (if publicly available) of the owners, the SWLF property boundaries, the SWLF operational boundaries and the one-mile radius.

(e) Conduct quarterly sampling in accordance with subparagraph V.4 below.

(f) Comply with paragraph II (Sampling, Analysis, and Recordkeeping Requirements) above.

3. A qualified GW scientist and a person representing the O/O as described in Rule 1200-1-7-.02(2)(a)7, 8 and 10 must certify the GW Quality Assessment Plan. If the initial plan is deficient, then a Notice of Deficiency (NOD) should be issued requiring a revised GW Quality Assessment Plan. If the revised Plan is deficient, a **Notice of Violation (NOV)** should be issued requiring a second revised GW Quality Assessment Plan. If the second revised GW Quality Assessment Plan is deficient, a **Second Notice of Violation (NOV)** should be issued requiring a third revised GW Quality Assessment Plan, and the DSWM Environmental Field Office shall submit an enforcement request due to the O/O's failure to provide an adequate GW Quality Assessment Plan.
Note: This is consistent with the DSWM Enforcement Policy. Discussions among the Field Office Staff, Enforcement Chief and, as appropriate, the Director, are in order for any unusual circumstances.

4. While the assessment plan is being developed and approved, and throughout implementation, the O/O must conduct quarterly sampling of all monitoring points (e.g., wells, springs, etc.) and submit results in quarterly reports. Quarterly the O/O shall sample and analyze all monitoring points (e.g., wells, springs, etc.) for the following:

1st Sampling Event:	All Appendix I constituents, any additional approved alternative parameters, and all other Appendix II constituents that have been previously detected during GW monitoring.
2nd Sampling Event:	All naturally occurring constituents with a statistically significant increase above background and all detected constituents that do not naturally occur (See subparagraph II.6 above).
3rd Sampling Event:	All Appendix II constituents and any additional approved alternative parameters.
4th Sampling Event:	All naturally occurring constituents with a statistically significant increase above background and all detected constituents that do not naturally occur (See subparagraph II.6 above).

5. The SWLF shall remain in the GW Quality Assessment Program until the extent and nature of contamination in the GW has been defined for all constituents that have been released by the SWLF and an acceptable corrective action GW monitoring program under Rule 1200-1-7-.04(7)(a)9(i)(I) has been implemented.

VI. Off-Site Drinking Water

1. The requirements of this section apply to a SWLF when:

(a) The O/O fails to comply with any compliance schedule under paragraph V (GW Quality Assessment Program).

(b) Assessment monitoring performed pursuant to paragraphs IV and V above find that Appendix II constituent(s) concentration(s) is **above** its GW protection standard at <u>any</u> down-gradient monitoring point for more than <u>one year</u> and the extent of contamination in the GW has <u>not been adequately defined</u>.

(c) The DSWM determines, based on site-specific conditions (e.g., karst geologic formations), that the provisions of this section should be implemented without waiting for a year of documented exceedances of a GW Protection Standard.

*Note: The DSWM is authorized to require the O/O take **any measure necessary** to protect human health and the environment [Rule 1200-1-7-.04(7)(a)9(i)(III)] and the DSWM may require such action at any time [Rule 1200-1-7-.04(7)(a)6(iv)(VIII)].*

2. As required pursuant to subparagraph VI.1 above, the O/O shall perform the following activities:

(a) Area GW User Survey

(i) The O/O will conduct a user survey that identifies all sources (wells and/or springs) used for drinking water within a one-mile radius from the center of the SWLF. However, the O/O may request a reduction or modification to the one-mile radius if adequate written justification (e.g., hydrogeologic barrier or divide such as river is within the one-mile radius) is provided by the O/O to, and accepted in writing by, the DSWM. All requested reduction or modification shall be made in writing with justification and be certified by a person representing the O/O in accordance with subparagraph II.8.

(ii) Unless a longer time period is allowed by the DSWM, the user survey will be completed and a report submitted to the DSWM within 45 days of the date the DSWM directs the O/O to perform the survey. The report shall contain a topographic map (or legible enlarged copy) identifying the drinking water sources, the latitude and longitude coordinates, the names, addresses and phone numbers (if publicly available) of the owners, the SWLF property boundaries, the SWLF operational boundaries and the one-mile radius (or alternative boundary accepted by the DSWM).

(iii) The O/O shall update the user survey required under subpart VI.2.(a)(i) at least on an annual basis and submit the results of the survey annually. In conjunction with the annual user survey, the O/O shall document the notification to all persons who own land or reside on the land that directly overlies any part of the plume of contamination if contaminants have migrated off-site. Notification is required under part V.2(c) above and Rule 1200-1-7-.04(7)(a)6(iv)(V).

(b) Monitoring of Off-Site Drinking Water Sources

(i) If assessment monitoring at the SWLF has determined that any Appendix II constituent concentration is **above** its GW protection standard, the O/O must collect representative GW samples from all drinking water sources identified in the Area GW User Survey and analyze each sample collected for: (1) all Appendix II constituents that do not naturally occur and were detected in the SWLF's GW, and (2) all naturally occurring Appendix II constituents that are **above** its GW protection standard. The O/O is not required to sample for any Appendix II constituent if a written demonstration is submitted to the DSWM, and the DSWM concurs that the constituent detected at the SWLF is a result of another source or natural variation under Rule 1200-1-7-.04(7)(a)5(iii)(III). Such demonstrations shall be certified by the O/O in accordance with subparagraph II.8 above and a qualified GW scientist. The O/O may request a reduction in the number of drinking water sources to be sampled if adequate written justification is provided and accepted in writing by the DSWM. All requested reductions shall be made in writing with justification and be certified by a person representing the O/O in accordance with subparagraph II.8 above. If any Appendix II constituent that does not naturally occur is detected, and/or if any Appendix II constituent that naturally occurs is detected above its GW protection standard, then the O/O shall notify the DSWM by telephone or fax of the detection within one working day and resample the water source and provide the analytical results to the DSWM within two working days. The time frame for the resample and notification begins when the O/O becomes aware of the analytical results .The complete results from the sampling and analyses of the drinking water sources must be submitted to the DSWM within 30 days of the

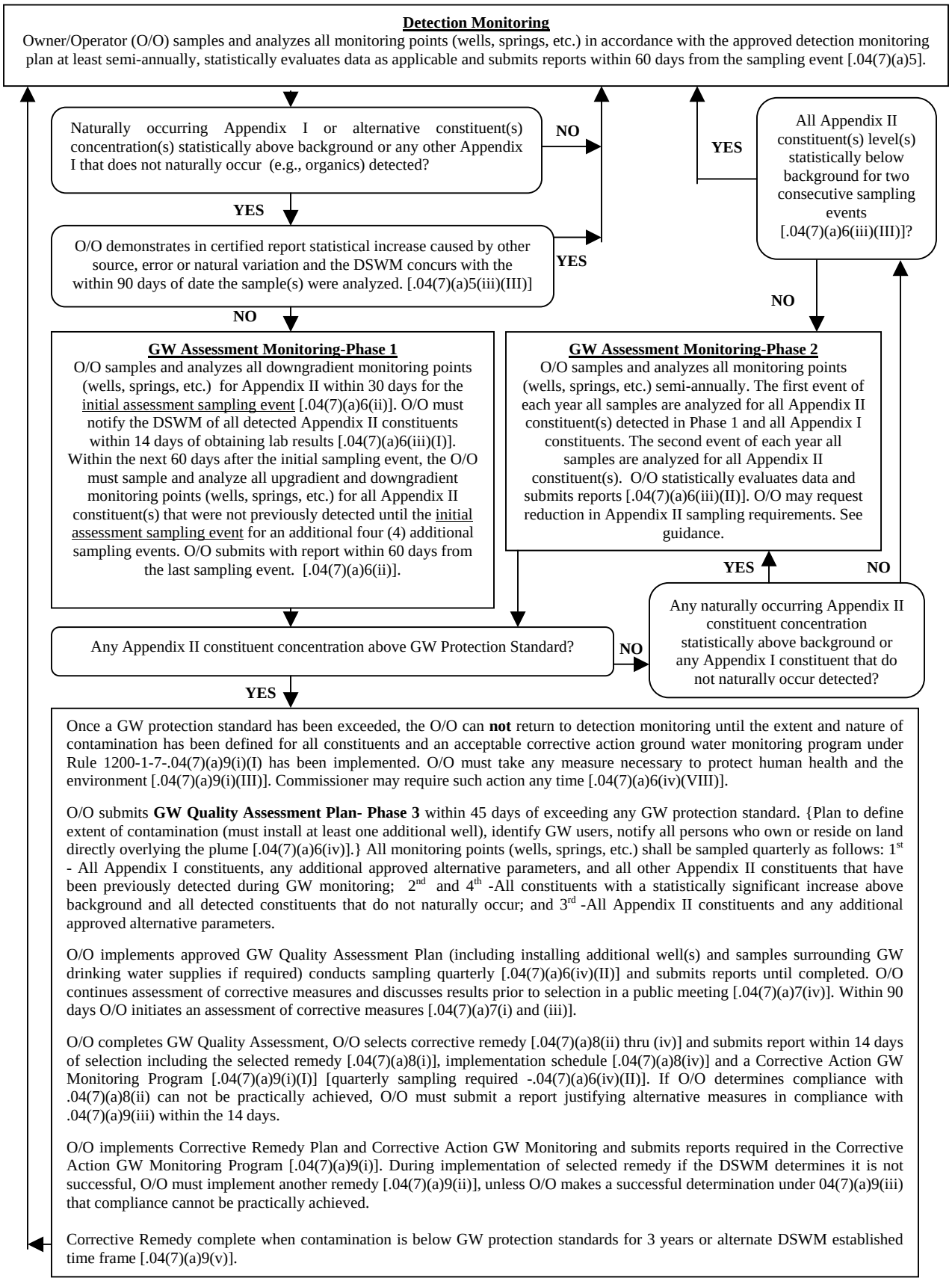
last day of the sampling event, and in a report that meets the requirements of subparagraph II.7 above.

(ii) The O/O must notify and provide the analytical results by letter to all off-site water source owners and users (renters, etc. if known), whose water sources were sampled. If the initial and verification sampling and analyses described in subpart VI.2(b)(i) above documents any detection of an Appendix II above its GW protection standard, the O/O shall notify the off-site water source owner(s) and users (renters, etc. if known) by telephone (if publicly available) and in writing by certified mail of the sampling/analyses results. If the O/O is unsure if any other person(s) uses the impacted off-site water source, then in the certified letter the O/O shall request the name(s), address(s) and phone number(s) (if publicly available) of any other users and inform the impacted off-site water source owner that they need to notify any other users. The O/O shall provide a copy of all correspondence and analytical results to the DSWM.

(iii) If the SWLF is the most reasonable cause of an Appendix II constituent being found above the GW protection standard(s) in an off-site drinking water source(s), then the DSWM staff shall recommend the O/O to provide the impacted off-site party with an alternative drinking water. If the O/O does not want to provide an alternative drinking water, the DSWM Field Office staff shall notify the Director and the Solid Waste Management Program Manager by telephone and by e-mail to determine the next steps for the Department regarding the impacted off-site water supply.

(iv) The O/O shall continue collecting and analyzing samples of off-site drinking water sources in accordance with subpart VI.2.(b)(i) semi-annually. The off-site samples shall be collected during 1st and 3rd sampling events listed in subparagraph V.4. This sampling shall continue until the approval of the Corrective Action GW Monitoring Program under Rule 1200-1-7-.04(7)(a)9(i)(I) or the site is in compliance with Rule 1200-1-7-.04(7)(a)9(v).

Attachment One
Ground Water Monitoring and Corrective Action for Solid Waste Disposal Facilities



NOTES: All reports must be submitted within sixty days of each sampling events [.04(7)(a)4(viii)]. This flowchart outlines the regulatory requirements for ground water monitoring and corrective action and any omission(s) do not negate any permit or regulatory requirements.

NOTICE

The guidance provided in this document is not intended, nor can it be relied upon, to create any rights enforceable by any party in litigation with the State of Tennessee. DSWM officials may follow the guidance provided in this document, or vary from said guidance, based on site-specific circumstances. The DSWM also reserves the right to change this guidance at any time without public notice.

[Signature of File] [4-19-06]

Mike Apple, Director **Date**
Division of Solid Waste Management

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